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Introduction

It is very difficult to say anything strikingly new about »effectiveness and efficiency in education«, particularly in the context of a symposium addressing the very broad question of the futures of education, and the classical types of discourse on effectiveness and efficiency do not necessarily offer an appropriate solution.

Of course, »effectiveness« and »efficiency« are elegant constructs, which obligingly lend themselves to commentary in terms of epistemological questions, but this would exceed the scope of this paper, and such commentary is widely available, whether in textbooks (e.g. Johnes 1993), in fundamental reflections on the appropriateness of the economic perspective on education (e.g. Delamotte 1998), in edited volumes offering complementary perspectives (e.g. Trier 1995), or in survey papers (e.g. Hanushek 1986, 1987; Card/Krueger 1996). »Effectiveness« and »efficiency« also hold in store ample opportunities for analytical refinement, but then the question of the relevance of the exercise would quickly arise.

I will therefore attempt to address effectiveness and education in a slightly different way, and after briefly recalling the analytical meaning of these concepts (if only because they are often used interchangeably in everyday speech), to plunge directly into some questions related to their application.

Most of the literature in the sub-field of education economics concerned with effectiveness and efficiency is made up of empirical research (for a recent overview, see Krueger 1999). With one more data set, yet another education production function could be estimated, relating a set of inputs with some or other measurement of performance; these measurements, in turn, could lend themselves to an interpretation in terms of effectiveness and efficiency.

However, instead of discussing the theoretical concepts, or presenting one more education production function, I have chosen to illustrate the notion of effectiveness with data that can serve to evaluate the relative contribution of formal in-school instruction as opposed to non-school channels of acquisition, in the case of foreign language skills. This paper is organized as follows: in

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Section 2, I recall the theoretical meaning of the concepts of effectiveness and efficiency, and then briefly discuss the traditional, but still perfectly relevant, analytical distinction between internal and external evaluation. Section 3 is devoted to a brief presentation of some of the problems of identification and measurement raised by these concepts, particularly with respect to the issue of appropriately defining the inputs and the outputs on which effectiveness and efficiency rest. Section 4 presents the application to the relative effectiveness of school and non-school channels of foreign language acquisition, and Section 5 contains a brief conclusion.

Effectiveness, cost-effectiveness and efficiency: theoretical notions

The notions of effectiveness, cost-effectiveness and efficiency are rooted in fundamental economic theory, but discussing this dimension would exceed the scope of this paper—besides, just about any neo-classical economics textbook contains a presentation (see e.g. LAYARD/Walters 1978). However, once we move away from pure theory and edge towards application, clear-cut meanings are sometimes blurred, and it is therefore important to clarify the meaning in which the terms will be used in this paper; alternative definitions can be found in the literature, and it must be clear that my goal here is not to posit one set of definitions as intrinsically superior to any other, but to adopt a set of definitions that will make it possible to distinguish clearly between three distinct notions of »what works«.

In what follows, we shall therefore carve ourselves a simple path through these notions and avoid some potentially difficult aspects. That these notions are not always easy to tease apart from one another is illustrated by the fact that in a very concise overview, HANUSHEK (1987, p. 33) starts out by saying that he will be talking about »efficacy« in education, thereby side-stepping, for the beginning of his presentation, the precise nature of the concept.

As a general starting point, we can say that what is »efficacious«, or »effective«, or »efficient«, is »something that works relatively well«, or at least no worse than some other alternative we care to think about. Suppose for example that our goal is to reach a certain level of fluency in a foreign language through traditional in-school instruction; it is probably more *effective* to study it for 4 hours per week during 4 years than for 2 hours a week during 2 years, all other things being equal.

However, such a notion of effectiveness, apart from being rather obvious, is of rather limited help: it is, of course, easier to reach a certain goal by investing considerably more resources into the endeavor. This is why, when reference is made to »effectiveness«, it often presupposes that one has actually already moved to a second step, and that the operative notion is that of cost-effectiveness (also sometimes referred to as »technical efficiency«)[1]. In this latter sense, »effectiveness« characterizes a technical, almost material relation between the inputs and the outputs in a production process; but it does not yet constitute a solution to the economic problem of the allocation of resour-

1 For an overview of cost-effectiveness, see e.g. Levin (1983).

ces. The reason for this is that the allocative dimension, stricto sensu, arises at a subsequent stage, namely, with the notion of efficiency, which will be introduced momentarily. For now, suffice it say that a production process can be considered *cost-effective* if, given a certain amount of resources, the results are as good as possible or if, given a certain goal, it is achieved at the lowest possible cost.

This is easily seen graphically (Fig. 1). Let us start from point A, where resource expenditure is x_2 and results are at level y_1. A concern for economizing resources while still ensuring the same result would lead us to move to point B (where we spend only an amount x_1 of resources, instead of x_2, while still securing an unchanged results level of y_1), whereas the wish to get the best possible result with an unchanged amount of resources induces a move to point C (where the unchanged expenditure in resources x_2 now yields a higher output y_2). The feasible area is located below the effectiveness boundary (shaded); the area above the boundary is not achievable under a given state of informational, technological, etc. development.

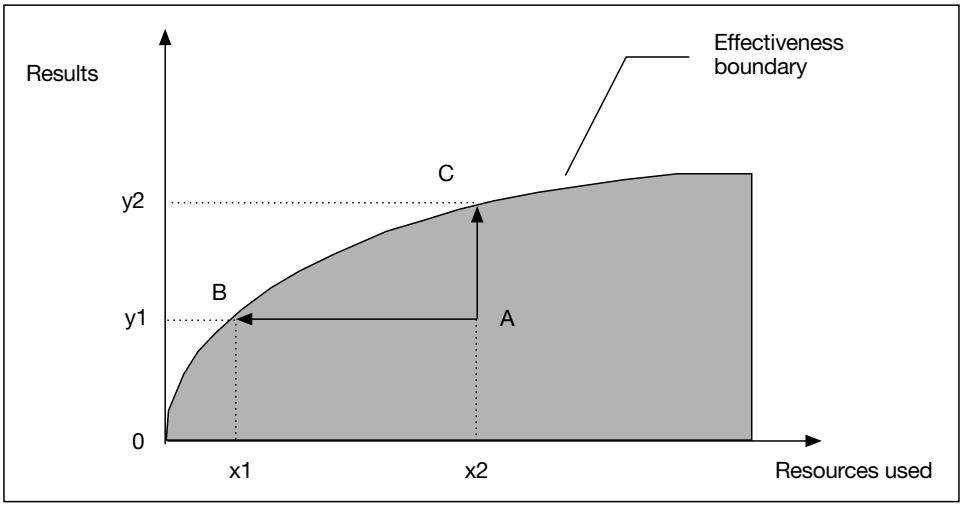

Fig. 1: **A graphical representation of cost-effectiveness.**

If cost-effectiveness presupposes that the best possible result is reached with a given input of resources, or that in order to achieve a given goal, no resources are wasted, proper management of an education system apparently means moving towards and staying on the effectiveness boundary while selecting a point on this boundary which is socially considered preferable to any other point. This way of looking at individual or collective action is, of course, quintessentially economic, because economics as a discipline is primarily concerned with the relationship between ends and scarce means.

However, »cost-effectiveness« so defined[2] is not a sufficient guide for action, because whether B, C, or any other point on the effectiveness boundary is best is quite another question! Point B suggests moderate achievements of the system, but at a low cost; point C represents higher achievements, but at a significantly higher cost. Which of these situations is to be preferred? Or should some other situation, somewhere along the effectiveness boundary, be considered superior to both B and C? This is where efficiency comes into play, which requires us to move on to the third element in our set of definitions. For a situation to be »efficient«, from the standpoint of economic analysis, it is not enough for resources to be used »in an economizing way«, that is, without wasting them: the absence of waste simply refers to »cost-effectiveness« (or »technical efficiency«) as described above. We have seen that cost-effectiveness can be achieved with an infinite range of situations – all those that are on the effectiveness boundary. But efficiency only obtains if the best possible point on this effectiveness boundary is reached.

This »best point« presupposes that efficiency is realized jointly at three levels: efficient consumption, efficient production, and efficient product-mix. In efficient consumption, given the prices of goods and services, consumers are not willing to trade a certain amount of the goods and services they have in return for a certain amount of other goods and services. In efficient production, it is not possible to increase the amount produced of a good or service without reducing the amount produced of some other good or service. In efficient product-mix, it is impossible, by modifying the combination of goods and services being produced, to increase the welfare of one person in the system without simultaneously reducing the welfare of at least another person.

Of course, this set of conditions is very extreme. It can obtain in a theoretical system defined by stringent, and unrealistic, assumptions. We first need a free-market economy, with perfectly defined property rights, to function competitively on all markets for goods, services and production factors. Then, we need to assume that (i) there are no increasing returns to scale; (ii) there are no technological external effects; (iii) there is no market failure connected with uncertainty. This situation does not exist in reality, which means that »efficiency«, in this pure economic sense, is a concept of limited relevance outside of research in fundamental economic theory.

When applying economic theory to the realm of education, particularly with respect to decision-making in education policy, effectiveness or efficiency will

2 This is often referred to as »technical efficiency«. Such an expression however, can be somewhat confusing, because it introduces the word »efficiency« without explicit consideration to its core theoretical meaning; see below.

often have to be replaced by looser concepts. Hence, in practice, an evaluation of effectiveness will tend to be structured around the question of whether a particular combination of inputs yields a higher or a lower result in terms of outputs; and an evaluation of efficiency will tend to be structured around the question of whether a particular output corresponds to what society wants. From now on, when talking about »effectiveness« and »efficiency«, I will be referring to these loose, but probably more realistic notions[3].

Before proceeding, however, one additional distinction must be made, namely, between internal and external effectiveness.

When studying the performance of education systems, we may first be interested in what determines the direct outcomes of the system. One such direct outcome is the performance of students at standardized tests, for example results achieved in international surveys such as TIMSS (Third international mathematics and science study). Once these results are measured, one can try to estimate the statistical relationship between achievement levels, treated as outputs of the system, with the inputs that have, presumably, made such achievements possible. Typical inputs include the teacher-student ratio, classroom homogeneity, teachers' training or number of years of experience, etc., – or, quite simply, expenditure per head. Such analyses are examples of internal effectiveness evaluation, because they focus on processes taking place within the education system.

However, the evaluation of effectiveness in education need not stop there. Education is not a goal in itself: it is supposed to equip learners with cognitive and social skills that will enable them to function in society, that is, to make a living, to enter in harmonious or at least socially appropriate exchange with others, etc. All these, ultimately, also are expected outputs of the education process, even though these outputs arise outside of the system. Hence, evaluating the effectiveness of the education system also raises the question of how good the system is at generating those outputs. In external effectiveness evalua-

3 Lemelin (1998) uses a distinction between »technical effectiveness« and »economic effectiveness« The former requires that scarce resources be used sparingly; this rule, however, can be addressed in physical units of the inputs used. The latter stresses that although different inputs are expressed in different (physical) units of measurement, they can all be converted into monetary units; »economic effectiveness« requires that in monetary terms, a mode of production should imply no waste of resources. »Economic effectiveness« constitutes a more demanding criterion than »technical effectiveness«, and corresponds to the notion of »cost-effectiveness« used here. The discussion of various concepts of effectiveness and efficiency can be related to the three fundamental questions of economics, namely: what to produce? how to produce it? and for whom to produce it? The first of these questions harks back to efficient product mix, and coincides to a large extent with the issue of »economic efficiency« as characterized in formal economic theory; the second is related to the issue of the appropriate use of inputs to generate a certain range of outputs, and hence harks back to a »generalized« (i.e., *across* goods and services) cost-effectiveness condition. As to the third question, it raises the question of the rules according to which the goods and services produced are apportioned among people; in a market economy with fully-defined and enforced property rights, this criterion is solvability. The resulting allocation of goods and services allows the condition of »efficient consumption«, which is part of »efficiency«, to be met. This, however, says nothing about distributive justice, which is why the analysis of distribution (or redistribution) needs to be addressed in addition to that of allocative efficiency.

tion, some roles are reversed. For example, the level of cognitive skills, which are typically treated as outputs in internal effectiveness evaluation, will now be treated as inputs. The outputs of the system can take many forms, include »market« and »non-market« effects, and be evaluated at the level of the individual actor (in which case we would be talking about »private« effects) or at the level of society as a whole (in which case we would be talking about »social« effects). Typically, the assessment of the external effectiveness of education (usually measured in years and taken »in bulk«, without distinguishing between the subjects taught or the specific skills acquired) takes the form of a regression of the logarithm of earnings on a set of independent variables, such as schooling (in years) or some indicators of specific skills.

The distinction between internal and external effectiveness evaluation, however, is not always easy to make. We know, for example, that there is interaction between school and non-school channels of acquisition of cognitive skills, particularly for social and relational skills (which schools are not always explicitly expected to impart), but also for more traditional school subjects, such as foreign languages; hence, some inputs are internal to the system, while others are not; and then it becomes unclear whether the output itself (in this case, a certain level of foreign language skills) must be seen as an internal one either.

This type of ambiguity points to some of the core problems of the effectiveness perspective on the performance of educational systems. Some of these are addressed in the following section.

Identification and measurement

The very idea of relating educational inputs and outputs supposes that the education process is being viewed as a production process. In orthodox economic analysis[4], the assumption made is that, if only because of entrepreneurs' drive to maximize profits, minimize costs and stay ahead of competitors, producers will have an incentive to pick the most *effective* production processes, so that the production functions relating inputs with outputs will necessarily capture the best-performing technology, allowing the maximum yield from a certain level of inputs[5]. In short, the assumption is that production functions are known, that both inputs and outputs are fully identified and measurable, and that decision-makers can freely modify the amount of inputs allocated to the production process.

However, none of these assumptions really holds in the education process, which remains, to a large extent, a black box: although it stands to reason that inputs include teachers' time and skills, students' time and effort, pedagogical materials, and some infrastructure, it is much more difficult to be sure about the relative importance of these inputs, or to be sure about the actual role of other inputs such as parents' education level or the influence of the peer group;

4 On the notion of »orthodoxy« in economic research, see Beaud|Dostaler (1993).
5 More precisely, this condition requires that the ratio of the marginal products of production factors is equal to the ratio of their unit costs.

finally, little is known about the interaction between all these inputs. In the same way, it is difficult to be sure that usual definitions of output are actually relevant. Standardized test results are subject to many forms of measurement error; they may not really measure the acquisition of skills at school; and even if they do, they may be able to rank-order students more than to reveal the extent to which students truly differ from one another in their skills levels. And then, it is far from obvious that focusing on one particular output is adequate, because education processes are typical examples of joint production: in addition to specific cognitive skills, they also serve to socialize students and endow them with a host of other competencies (such as adaptability, the capacity to organize themselves in order to deal with given assignments, etc.).

In short, analyzing education in terms of a production function implies the willingness to rely on an instrument whose building blocks are clearly identified and measured inputs and outputs, whereas in education processes, both inputs and outputs are inadequately identified, let alone measured.

The results of internal effectiveness evaluations are described by KRUEGER as »generally […] ambiguous, conflicting, and weak« (1999, p. 497). However, some results emerge relatively more frequently regarding the success rate of students in standardized tests: (i) the success rates bear no significant relationship with class size; (ii) they bear no significant relationship with the level of training undergone by teachers; (iii) they seem to be positively correlated with teachers' level of experience. Unfortunately, different or even opposite results also arise; nonetheless, they are interesting enough to generate considerable investment in this line of research, which remains one of the most active in contemporary education economics.

One additional, and frequently overlooked point, is that viewing performance strictly in terms of outputs (whether standardized test results or other) implies that little attention, if any, is paid to the educational process: it is all fine and well for the students of a school to get brilliant results at standardized tests with a lot of hard work by students and a low teacher-to-student ratio, but this may also entail a high degree of stress and compulsion for teachers and students. Whether this aspect can legitimately be ignored is not a forgone conclusion.

One might argue that when comparing two education systems or two schools within a system, if similar errors are made on both sides, then the comparison will still yield interesting information. This point is well-taken; however, the empirical observation of the actual operation of schools in terms of the relationship between inputs and outputs may indeed reveal that some schools do better than others, if they get »better« results with a given level of output. It does not follow, however, that it represents the best possible result; nothing enables us to conclude that it would not be possible to do better (perhaps by departing quite fundamentally from the mode of operation of the »best« school). By and large, empirical estimates will reveal average performances. Even with a fairly clear performance ranking between systems or establishments, the degree of variability between the environmental conditions in which different establishments operate makes it very difficult to argue that whichever school or systems apparently performs best is a model that all other establishments can validly strive for.

Given this somewhat mediocre record, one may wonder why so much attention and effort is being lavished on the study of effectiveness and efficiency in education. Part of the answer may lie with some of the biases in the ideology and practice of economics (on this point, see Mayer 1993); however, the other, and worthier, reason is that the set of questions »what works?« »under what circumstances?« and »for what reasons?« remain perfectly valid intellectually, and arguably indispensable as a guide to policy decisions.

The effectiveness of school v. non-school channels of foreign language acquisition

This question arose in the context of a large-scale research project on the evaluation of language education in a macro-level, mostly »external« context (Grin 1999a). The main goal of this project was to evaluate the external effectiveness of second language skills by estimating the earnings differentials accruing to residents in the three main language regions of Switzerland (German, French and Italian; the much smaller Romanche-speaking region was left out of the study) depending on their competence in other national languages and in English – which is not a national or an official language of Switzerland, and is the mother tongue of less than 1% of the resident population (foreign residents included).

For this purpose, a telephone survey was carried out on a representative sample of 2'400 people in gainful employment at least 6 hours per week (as a share of the resident population, this is equivalent to a sample of approximately 92'000 people in the U.S.). Data collected include respondents' first language (L1), their degree of competence in various foreign or second languages (L2s), several standard socio-economic characteristics, and labor income. In addition, information was collected on the channels of second language acquisition apart from foreign language education received at school. This made it possible to study the relative contribution of school and non-school channels of foreign language acquisition to declared skills; hence, the level at which we could, with this part of the data, approach the relationship between inputs and outputs is somewhere between those of internal and external efficiency evaluation.

I will not go into the detail of the methodology used in data collection, particularly as regards the techniques used to guarantee the actual meaning and comparability of the information provided by individuals self-assessing their second language skills, since this information is provided elsewhere. Another point not discussed here, despite the fact that it represents, in my opinion, a relevant one with respect to future developments in research work on the study of effectiveness in education, is the reason for this focus on foreign languages. Suffice it to say that apart from their growing relevance in political and economic terms, foreign language skills as a subject offer a very convenient entry point into a subject-based approach to a wide range of issues in education economics, including effectiveness evaluation and the study of cost and expenditure patterns (Grin/Sfreddo, 1997).

The empirical results are generated by a simple OLS regression of the form:

$$C_i=b_0+b_1\ LIV_i+b_2\ STA_i+b_3\ SCO_i+b_4\ INF_i+b_5\ EVG_i + b_6\ DUR_i$$

The dependent variable *C* is a foreign language competence index computed as the unweighted average of listening, speaking, reading and writing competence. The independent variables have the following meaning, starting with a set of simple dummy variables:

- LIV: having lived in an environment in which the target language (L2) is spoken, for more than 6 months and after the age of 5;
- INF: having used the target language in the family during childhood;
- STA: having taken one or more language stays (e.g., three weeks' summer camp in Cornwall);
- EVG: having taken evening classes in the target language
- SCO: having been schooled through the medium of the target language.

The model also includes a variable *DUR* whose coefficient indicates the average contribution of the marginal year of the target language as a school subject; it is multiplied by the number of years *T* during which the subject has been studied. The resulting product <*DUR x T*> variable therefore reflects the average *ex-post* contribution of schools, which can be compared to the average *ex-post* contribution of the other channels of acquisition.

Since the emphasis of this paper is not on language acquisition, but on the relative effectiveness of formal in-school courses as opposed to other channels of acquisition, figures are not reported here (but they can be found e.g. in Grin 1995, Chap. 6). Rather, I wish to stress another aspect of the issue by focusing on the rank-ordering of variables in terms of their effectiveness, as shown in Table 1. Although this table would lend itself to extensive commentary, I wish to highlight two results only.

First, contrary to what is often asserted in public debate, in which many complain that even seven years of German (or French) as a foreign language[6] fail to impart any language skills worth mentioning, schools do make a difference – particularly when German is the foreign language being learned.

The second important finding is that the relative effectiveness of schools is dependent on the target language being studied and on learners' first language. What works for learning English is not the same for speakers of German or French; and speakers of German or French rely more on one or another channel of acquisition, depending on the target language. As regards in-school teaching, it is always significant, and can be more important, ex post, than other channels of acquisition of the language. The same, by and large, applies for French as a foreign language. Interestingly, the situation is quite different for English, which is acquired relatively less through school and relatively more through other means.

6 Learners in French-speaking Switzerland preparing for university typically have German as a compulsory subject throughout secondary school, which amounts to seven years of instruction for an average of 4 to 5 periods per week.

Rank-ordering of channels of L2 acquisition according to effectiveness by L1 and L2, statistically significant coefficients only

L2	English			German		French	
L1	German	French	Italian	French	Italian	German	Italian
1	CONST	INF	LIV	INF	DUR X T	DUR X T	LIV
2	LIV	LIV	STA	DUR X T	LIV	LIV	DUR X T
3	INF	DUR X T	CONST	LIV	INF	INF	STA
4	DUR X T	CONST	DUR X T	SCO	SCO	SCO	CONST
5	STA	STA	–	STA	EVG	CONST	–
6	SLF	EVG	–	CONST	CONST	EVG	–
7	–	SCO	–	EVG	–	STA	–
8	–	–	–	–	–	SLF	–

Shaded cells: Contribution to L2 competence on 0-100 point scale exceeding 10 points; all shaded coefficients significant at the 5% level. Cells framed by bold line indicate traditional in-school instruction.

These are, of course, ex post results, on the basis of which it would not be possible to claim that a francophone wanting to learn English should not take evening classes; they simply reflect what has occurred, and show that whatever competencies are currently distributed in the population, the relative effect of different channels of acquisition to this current distribution of skills is more or less as described above.

This form of effectiveness evaluation is simple, and could be described as rough-and-tumble; however, it provides information that feeds directly into an ongoing debate in language education policy, and provides background information for students who are now (as a result of a recent reform in secondary school syllabi across the country) confronted with the difficult problem of selecting which foreign language they will study towards the degree (maturité; Abitur) that they need to obtain before going to university (Grin 1999b).

Concluding remarks

The preceding section has focused on effectiveness rather than efficiency – in terms of the definitions presented in Section 2. As noted then, the economic concept of efficiency is a rather theoretical one; hence, moving from an evaluation of effectiveness to an evaluation of efficiency in the actual selection, design and implementation of an education policy usually has to mean something different from the purely theoretical approach. I submit that in practice, evaluating efficiency will come down to the following two steps.

First, it is incumbent upon social actors, through the working of democratic institutions, to define and agree on a set of objectives; this remains, ultimately,

a political process. Second, the most cost-effective way to achieve these objectives has to be identified, adopted and implemented. Hence, the contribution of education economics is mostly an instrumental one, which does not tell social actors what to do, but can help in selecting the best way to do it. Perhaps more importantly, it provides an analytical framework which is useful to conceptualize problems and to produce relevant information about them.

The concepts of effectiveness and efficiency are intellectually challenging, but their application is difficult, both theoretically and empirically. They can also be dangerous, because they can distort our approach to education issues and can be politically manipulated. In closing, I would therefore argue in favor of a way of using the concepts of effectiveness and efficiency that remains closely connected to, or even proceeds from, the actual issues arising in the selection, design and implementation of education policies. This is crucially important in order for researchers not to loose sight of the ultimate goal, namely, the improvement of education and a better quality of life for all.

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